IB MATH HL TEST

EXPONENTS – LOGARITHMS

Paper 1 - (without GDC)

Mark___/80

Grade_____

Name:_____

1. *[Maximum mark: 7]*

Let $\log_2 3 = a$, $\log_2 5 = b$. Express the following in terms of a and b:

(a) $\log_2 60$ (b) $\log_4 0.2$ (c) $\log_3 25$ *[2+3+2 marks]*

Answer

2. *[Maximum mark: 5]*

Solve the exponential equation

$$2^{x+5} = \frac{3 \cdot (5^x)}{2^{x-2}}.$$

Give your answer in the form $x = \frac{\ln a}{\ln b}$, where $a, b \in Q$.

Answer

3. *[Maximum mark: 6]*

Solve the exponential equation

$$2^{x+5} = 8 + \frac{3}{2^{x-2}}.$$

Give your answer in the form $x = a + \log_2 b, \quad a, b \in Z$.

Answer

4. *[Maximum mark: 8]*

Find the values of

(a) $A = (\log_2 3)(\log_3 4)(\log_4 5)\cdots(\log_{15} 16)$, as an integer *[4 marks]*

(b) $B = \log_2 3 + \log_2 3^2 + \log_2 3^3 + \cdots + \log_2 3^{20}$ in the form $a \log_2 b$ *[4 marks]*

Answer

5. *[Maximum mark: 7]*

Solve the logarithmic equation

$$\log_{\sqrt{5}}(4-\frac{x}{5})-4\log_5(\frac{x}{5})=2$$

Answer

6. *[Maximum mark: 6]*
Solve the logarithmic equation

$$\log_x 2 - 3\log_2 x = 2$$

Answer

7. *[Maximum mark: 6]*

Solve the equation

$$\ln(e^{4x} - 8) = 2x + \ln 7$$

Answer

8. *[Maximum mark: 7]*

It is given that $\log_a(x^2 y) = p$ and $\log_a\left(\frac{x}{y^2}\right) = q$

(a) Find $\log_a x$ and $\log_a y$ in terms of p and q. *[5 marks]*

(b) **Hence** find $\log_x y$ in terms of p and q. *[2 marks]*

Answer

9. *[Maximum mark: 6]*

The mass *m* kg of a radio-active substance at time *t* hours is given by $m = 8e^{-kt}$. The half life time of the substance is 3 hours.

(a) Find the initial mass of the substance. *[1 mark]*

(b) Show that $k = \frac{\ln 2}{3}$ *[3 marks]*

(c) Given that the mass of the substance after t hours is 1kg, find the value of t. *[2 marks]*

Answer

Answer